

The Trigger System for STAR

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The STAR experiment at RHIC is investigating matter at very high temperatures and densities. The RHIC beams cross at STAR every 107 ns, and the trigger system must examine every crossing to see if an interesting interaction has occurred. The system was designed in three parts:

- 1) Three fast trigger detectors
- 2) A set of custom, pipelined, digital PC boards to take a first look at the data and trigger the rest of STAR
- 3) Two CPUs farms to perform more detailed analyses and potentially abort the event.

The trigger detectors consist of: a barrel of scintillator slats surrounding the TPC (CTB), two zero-degree calorimeters (ZDC), one on either side of STAR, and the TPC endcaps instrumented as multi-wire proportional chambers (MWC). The data from these detectors is stored in a tree of Data Storage and Manipulation boards (DSM) that also analyze the data, calculating, for example, the sum of the CTB ADC values.



Fig. 1. The STAR Trigger Electronics Tree

The DSM calculation results go to the Trigger Control Unit (TCU), along with the detector “busy” states, where the TCU decides whether or not to issue a trigger (see Fig 1.). Triggers are distributed to the detector subsystems via the Trigger Clock Distribution modules (TCD).

The electronics was installed and used for the first time during the Summer 2000 Au-Au Run at RHIC [1]. All the modules were 9U VME boards, installed on the platform next to the STAR detector. The DSM tree was used to sum the 240 8-bit ADC values from the CTB and compare the two ZDC signals to pre-determined thresholds. Figure 2. shows the measured relationship between one ZDC signal and the summed CTB ADC values, when both ZDCs were hit.

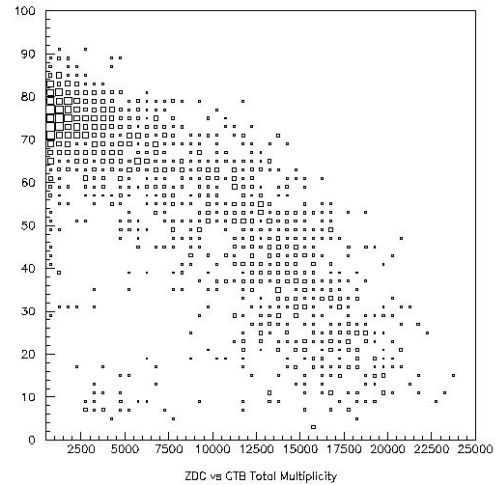


Fig. 2. ZDC signal versus Summed CTB ADCs

STAR then triggered on a coincidence between ZDC hits and the summed CTB ADC values being over threshold.

Footnotes and References

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[1] E. G. Judd et al. Annual Meeting of the APS Division of Nuclear Physics, held Oct.7-4, 2000 in Williamsburg, VA.